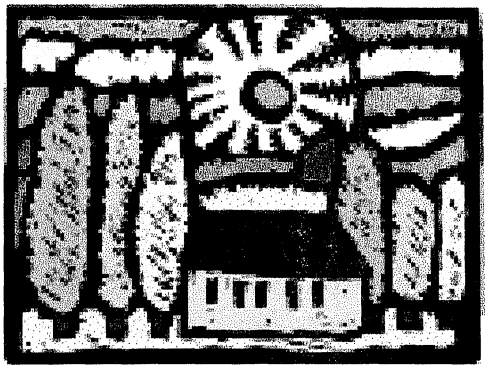
REFERENCE PACK

Best Practice Resources for Mitigation of Environmental Impacts

SMALL-SCALE CONSTRUCTION



USAID/West Bank and Gaza Course in Environmental Assessment and Environmentally Sound Design for Small-Scale Activities

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Resource and Environmental Strategies

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TABLE OF CONTENTS

This document is designed to be a reference for identifying potential environmental impacts resulting from small-scale construction projects, as well as containing best practices for mitigation of those impacts. The following resources are included:

A. *Environmental Guidelines for Development Activities*, "Small-Scale Construction," Tellus Institute, 2001 (Draft)

B. *Temporary Erosion and Sedimentation Control Plan,* Washington State Dept. Transportation, 2001

C. *Guidance on EIA Scoping,* Environmental Resources Management, Edinburgh, UK, 2001

http://europa.eu.int/comm/environment/eia/eia-guidelines/g-scoping-full-text.pdf

D. *Construction Best Management Practices*, Louisiana Department of Environmental Quality, 2001

http://nonpoint.deq.state.la.us/conbmp.html

E. *Environmental Impact Assessment Training Resource Manual*, UNEP, 1996

F. *Construction Health and Safety Checklist,* UK Health & Safety Executive, 1999

http://www.hse.gov.uk/pubns/cis17.pdf

G. *General Access Scaffolds and Ladders,* UK Health & Safety Executive, 1997

http://www.hse.gov.uk/pubns/cis49.pdf

H. *Trade Contractor Quality Control,* NAHB Research Center, 1997

http://www.nahbrc.org/tertiary.asp?TrackID=&CategoryID=679&DocumentID=1016

I. *Inspection Checklists for Trade Contractors,* NAHB Research Center

http://www.nahbrc.org/tertiary_print.asp?TrackID=&CategoryID=679&DocumentID=1021

J. *The Devil is in the Details*, NAHB Research Center

http://www.nahbrc.org/tertiary_print.asp?TrackID=&CategoryID=679&DocumentID=1025

K. *Integrating Quality and Safety Programs*, NAHB Research Center

http://www.nahbrc.org/tertiary_print.asp?TrackID=&CategoryID=679&DocumentID=1025

Small Scale Construction

Brief Description of the Sector

Virtually all small-scale development activities—housing, sanitation, water supply, roads, healthcare, energy, etc.—involve some amount of construction. Construction describes one or more of a set of diverse activities: demolition; site-clearing; grading, leveling, and compacting soil; excavating; laying pipe; installing equipment; or erecting structures. The benefits of construction come not from construction per se, but from the buildings and infrastructure which are its result.

The details of the construction carried out in support of any particular development activity or site will have a number of unique aspects. Construction activities in general, however, share a set of common features and common potential adverse environmental impacts.

This sector briefing addresses a number of these common elements. It is intended to apply to the types of projects mentioned above as well as the construction of schools, health posts, storage silos, market or community centers, fire observation towers, and any similar small-scale construction project. It is only intended to identify key issues and illustrate potential mitigation measures. Detailed guidelines for the specific type of project should also be consulted.

Potential Environmental Impacts of Construction and Their Causes

The potential adverse environmental impacts of construction are both direct and indirect. An example of a direct impact is filling a wetland to use as the project site. Indirect impacts are induced changes in the environment, population, and use of land and environmental resources. Examples of indirect impacts include:

- in-migration of population to take advantage of schools, health posts or other infrastructure;
- siltation of steams associated with erosion at construction sites; or
- the spread of disease from insect vectors breeding in flooded and abandoned quarries and borrow pits (areas from which construction materials were excavated).[1]

Another example could be a construction project's use of unsustainably extracted timber, which contributes to degradation of a forest some distance away. Direct impacts often receive more attention, but indirect effects can be equally significant.

Do not ignore the direct and indirect impacts of *associated* or *ancillary* activities. For example, construction of a small-scale irrigation system may require construction of a new road or improvement of an existing road so that materials and equipment can reach the project site. The road is an *associated* or *ancillary* activity with its own set of environmental impacts. The size and scope of both indirect and ancillary effects may be magnified over time, or through the cumulative effects of building many small facilities.

Construction can also have significant effects on public health—roads can provide a vector for the spread of AIDS and other communicable diseases. Construction workers themselves can be disease vectors.

All potential impacts should be considered and mitigated to the extent possible, but the most significant impacts should be addressed first. As in any project, the best way to accomplish this is by careful planning and incorporation of mitigation measures during the planning and design phase of a project.

Environmental impacts of special concern include:

Damage to sensitive or valuable terrestrial ecosystems. Construction in wetlands, estuaries or other sensitive ecosystems may destroy or significantly damage exceptional natural resources and the services they provide. This damage may reduce economic productivity, impair essential ecosystem services (such as flood control or breeding habitat for food fish), or degrade the recreational value of these resources.

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[1] *Topic Briefing: An Introduction to Environmental Assessment.* M Stoughton, ed. USAID/Bureau for Africa. Sept 2000 Draft.

Compaction of the soil and grading of the site may alter drainage patterns and water tables, changing access to water by animals, people and vegetation, as well as the quality of water resources (see below). Extraction of construction materials such as wood, stone, gravel, or clay may occur in a way that damages terrestrial ecosystems. (E.g. wood may come from relatively undegraded forests.)

Sedimentation of surface waters. Removal of natural land cover, excavation, extraction of construction materials, and other construction-related activities can result in soil erosion. Erosion can in turn lead to sedimentation in receiving waters. Sedimentation may (1) reduce capacity of ponds and reservoirs, increasing flood potential; or (2) otherwise substantially alter aquatic ecosystems by changing streambed, lakebed and estuary conditions.

Contamination of ground and surface water supplies. Toxic materials are often used in construction. Examples include solvents, paints, vehicle maintenance fluids (oil, coolant), and diesel. If these are dumped on the ground or wash into streams they may contaminate ground or surface water supplies. This may harm the health of the local community, as well as populations living down gradient and downstream. Aquatic and terrestrial ecosystems may be damaged. Where inadequate sanitary facilities are provided for construction crews, human waste may contaminate water resources.

Adverse social impacts. Construction may displace local inhabitants, or reduce their access to environmental resources. (For example, farmers' income or subsistence may be reduced). Construction on or near culturally important sites (cemeteries, worshipping areas, meeting places) may generate conflict with the local community. If the new facility provides a valuable service not available elsewhere it may cause migration to the area. Noise and dirt from the site may disturb neighbors. If local labor is not used this may also generate resentment.

Spread of disease. An influx of construction workers from other regions or construction of a new road may introduce new diseases to the local population or increase the incidence of local infection. This is a particular concern with sexually transmitted diseases, such as HIV.

Specific types of facilities such as those for healthcare, sanitation, and solid waste can also increase the spread of a variety of diseases. New or improved roads provide vectors for the spread of disease.

Damage to aesthetics of site/area. If the structure is too large, the architectural style is not consistent with local architectural customs, or it is sighted with inadequate attention to existing aesthetic viewshed qualities, the facility may harm the visual quality of the area.

Sector Program Design—Key Questions for Construction Projects[2]

Apply best practices. All best practices discussed in Chapter 2 of this volume ("An Introduction to Environmentally Sound Design") apply to the construction dimension of projects. These include engaging the local population in planning, decision making, financing, and even construction, giving special attention to engaging women, using an adaptive management process, etc.

Consider the full range of impacts. When planning a construction project and evaluating various options, project developers must examine all the classes of impacts described above—direct, indirect, ancillary, cumulative and socio-cultural. Assessment of indirect effects is especially important for large infrastructure development projects. Ancillary, cumulative, and socio-cultural effects can occur at any scale. Their strength is likely to be proportional to the size of the project.

The following questions, set out by project phase, are intended to stimulate consideration of the this full range of impacts. Consult the mitigation and monitoring tables for measures which address these impacts.

Site Selection

- What are the current uses and activities at the proposed project site? Who will be displaced?
- How close are neighboring residences?

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[2] Incorporates material from: "Checklist #2 / Building Construction" (1997). *Handbook on Environmental Assessment of Non-Governmental Organizations and Institutions Programs and Practices.* Canadian International Development Agency.

- What types of environment, landscape, flora and fauna are present in the area? Are any species of particular biological, medicinal, cultural, historical, social or commercial value— and, if so, could the project damage them?
- Is the site itself of cultural, archeological, historical, or social value?
- Are there any bodies of water, wooded areas, slopes, wetlands or other vulnerable sites nearby?
- Is the area and/site prone to landslides, flooding, heavy rainfall, earthquakes and other disasters?
- The site steeply sloped? Is the soil sufficiently stable? What is its thickness, texture, drainage and topographical features?
- How distant is the site from intended users?
- Would use of the site require construction or improvement of a road?
- Are water and sanitary facilities readily available or would they need to be provided?
- Is there historical data available on precipitation, surface water flows and climatic conditions?
- Can the extent and quality of groundwater supplies be determined? Are historical and seasonal data available?

Planning and Design

- What are the local zoning, building, and permitting requirements?
- Is the proposed design constructed of material appropriate to the climate and site
- Are erosion and flood protection measures incorporated?
- Is this a small isolated project or one of many similar projects?
- Will ancillary or associated infrastructure development be necessary?
- What indirect effects are possible? (e.g., if a new road is to be built in a forest, will the road encourage illegal logging and poaching)?
- What are the types, quantities and source of construction materials? Where does the material come from? (e.g., quarries, borrow pits, cutting from relatively undegraded forest?)
- Where will workers sleep? What types of water supply, sanitation, and solid waste disposal will be provided for workers? Have steps been taken to ensure that these services are provided in an environmentally sound manner?
- If water supply and sanitation facilities will be constructed have they been designed according to the "Water supply and sanitation" sector briefing in this volume?
- If healthcare facilities will be constructed, will their waste streams be handled in according to the "Healthcare waste: Generation, handling, treatment and disposal" sector briefing in this volume?

  (e.g., is there a waste storage room, an incinerator (if rural), a space for encapsulation, and a plastic/clay lined pit for safe burial?) How will grey water from bathing and washing of bedding, etc. be disposed of? What system of human waste disposal will be provided so as not to create undo health risks? How will water be provided to the facility in a manner that minimizes risk of contamination for patients and nearby communities?

- If the facility will generate solid waste, does the design include space and features for source separation of recyclables and organic waste as described in "Management of solid waste from residential, commercial and industrial facilities" in this volume?

- If hazardous chemicals, radioactive waste or other types of hazardous materials will be produced, does the design include proper storage, handling and disposal facilities as described for some sectors in "Activities with micro and small enterprises (MSEs)" in this volume? (These materials would include heavy metals, oil, lubricants, batteries, dyes, glue, solvents, acids, etc.)
- If cooling waters, soaking waters, or water containing suspended matter, mercury, lead, soaps or other previously mentioned products, and so on, be generated, does the design include elements for treatment, storage, and discharged as described for some sectors in "Activities with Micro and Small Enterprises (MSEs)" in this volume?
- What kind of public health education will construction workers receive?

Construction Phase

- Where will construction crew come from? Will construction schedule compete with local crop harvesting?
- What site preparation and construction activities will be carried out? Will there be demolition, excavation, leveling, clearing, filling, backfilling or wetland reclamation?
- How will any construction and demolition debris be disposed of?
- How will the materials be conveyed to the site and stored?
- What toxic materials will be used during construction? Are non-toxic substitutes available? Are measures in place for to ensure that toxic materials are properly disposed of?
- What measures for monitoring environmental impacts and adherence to environmental guidelines are in place?

Environmental Mitigation and Monitoring Issues

Table 1: Environmental Mitigation and Monitoring Issues for Construction-related Aspects of Development Projects

Issue or aspect of activity	Impact *The activity may. . .*	Mitigation *Note: Mitigations apply to specified project phase: Site Selection (SS); Planning and design (P&D), Construction (C), or Operation and Maintenance (O&M)*
Site Selection (SS)		
Site occupied or used by local residents	Displace untenured residents or reduce farmer, herder, gatherer's lands	Find alternative location (SS). If that is not possible: Provide equivalent land and/or accommodations or fair monetary compensation, provided these are accepted voluntarily and without coercion (SS)
Dwellings located close by	Facility and/or construction disturb neighbors, creating noise and dust	Build as far as practical from neighbors (SS) Concentrate noisiest types of work and take measures to keep dust to a minimum (C) Wet ground if water is abundant and/or leave natural cover intact as long as possible (C) Screen facility with trees or fencing to control noise (P&D)
Site has historic, cultural, or social importance	Offend local population; damage local social fabric	Find alternative site (SS)
Difficult for intended users to reach (steep climb or decent, distant location)	be unused or underutilized	Find alternative site or find some way of making access easier e.g. providing bicycle cart shuttle service to health clinic (SS) (O&M)
Site would require road improvement or new road construction (Also consult "Rural Roads" in this volume)	Cause one or more of a set of adverse environmental impacts typical of roads, including erosion, changing water tables, or providing access for illegal mining logging or poaching	Find alternative site. Evaluate whether a footpath would suffice (SS) (O&M) Follow guidance on design, construction, and operation and maintenance described in "Rural Roads" and resources listed there

Issue or aspect of activity	**Impact** *The activity may. . .*	**Mitigation** *Note: Mitigations apply to specified project phase: Site Selection (SS); Planning and design (P&D), Construction (C), or Operation and Maintenance (O&M)*
Site contains habitat for important ecosystems, animals or plants	Destroy or harm important ecologically, culturally, and/or economically important ecosystems, plants, or animals	Find alternative location. If that is not possible: (SS) • Design facility so that it will create least impact (P&D) • Minimize disturbance of native flora during construction (P&D) (C) • Remove, without destroying, large plants and turf where possible (C) • Replant recovered plants and other flora from local ecosystem after construction (C)
Site has important scenic, archeological or cultural/historical features	Destroy or harm sites with exceptional resource values	Find alternative location. If that is not possible: (SS) • Design facility so that it will create least impact (P&D) • Minimize disturbance of site during construction (P&D) (C) • Remove, important artifacts,where possible (C) • Provide worker incentives for discovery and safe removal of archeological or paleological material. (SS) (C)
Site is wetland or abuts water body	Destroy or harm valuable and sensitive ecosystems and organisms	Find alternative site. Wetlands and riparian ecosystems are extremely sensitive. Wetlands provide important environmental services such as filtering toxins and nutrients from runoff(SS). If no alternative is available: • Set back the facility as far as possible from the water body/wetland and minimize the amount of wetland destroyed by facility footprint and due to construction activity (SS) (P&D) • Revegetate as soon as possible (C) *If facility will include sanitation facility find alternative site* (SS)
Site is steeply sloped	Cause erosion and damage to terrestrial and aquatic ecosystems in construction or use	Find alternative site (SS). If that is not possible: • Design facility and apply construction practices that minimize risk, e.g., use hay bales to control erosion during construction. Pay particular attention to potential erosion and redirection of water flows during design and construction (C) (SS) (P&D) • Revegetate as soon as possible (C) • Maintain design features (O&M)

Issue or aspect of activity	Impact *The activity may. . .*	Mitigation *Note: Mitigations apply to specified project phase: Site Selection (SS); Planning and design (P&D), Construction (C), or Operation and Maintenance (O&M)*
Area is heavily wooded	Degrade forest. Contribute to flooding potential	Find alternative location if area is old growth or relatively un-degraded forest (SS). If that is not possible: • Design so as to minimize the number of trees that must be cut down (P&D) • Avoid destroying rare or unique trees. Consult with local populations about current use of trees and preferences for preservation (SS) (P&D) (C)
Site prone to flooding	Be destroyed and/or subject workers or inhabitants to risk of injury or death Cause environmental damage from accidental release of toxic, infectious or otherwise harmful material during flooding. Contaminate drinking water	Find alternative site or design facility so it is raised above flood plain, if possible (SS) Design facility to minimize risk, e.g. , design with proper grading and drainage (P&D) Maintain design features such as drainage structures (O&M) Avoid constructing sanitation or other facilities that will use and store such materials at flood prone sites (SS). If that is not possible: • Design storage area so that hazardous materials are above the ground and/or in waterproof containers with locking lids that are kept closed. Ensure that facility operators follow these practices (P&D)(O&M) • Chose dry sanitation options such as a dehydrating toilets, instead of wet ones such as septic tanks or detention ponds (P&D)
Area and/site prone to landslides	Be destroyed and/or subject workers or inhabitants to risk of injury or death Cause environmental damage from accidental release of toxic, infectious or otherwise harmful material during flooding Contaminate drinking water	Find alternative site on stable ground. If that is not possible: (SS) • Design facility to minimize risk, e.g., plant trees all around facility ((P&D) • Maintain design features (O&M) Avoid constructing sanitation or other facilities that will use and store hazardous or biohazardous materials at landslide-prone sites (SS). If that is not possible: • Design storage area so that hazardous materials are stored in durable leak proof containers with locking lids, and that these are kept closed (P&D)(O&M) • Chose dry sanitation options such as a dehydrating toilets instead of wet ones such as septic tanks or detention ponds (P&D)

Issue or aspect of activity	Impact *The activity may. . .*	Mitigation *Note: Mitigations apply to specified project phase: Site Selection (SS); Planning and design (P&D), Construction (C), or Operation and Maintenance (O&M)*
Planning and Design		
Area experiences heavy rainfall, earthquakes	Be destroyed and/or subject workers or inhabitants to risk of injury or death	Design facility to minimize risk, e.g., in earthquake prone areas, build structures with wood frames instead of concrete or brick (P&D) Maintain design features (O&M) Use material appropriate to the climate (e. g., stucco instead of adobe in areas with heavy rainfall) (P&D) (C)
	Cause environmental damage and/or contaminate drinking water via accidental release of toxic, infectious or otherwise harmful material	Design storage area so that hazardous materials are above the ground and/or in waterproof containers. Ensure that facility operators follow these practices (P&D)(O&M) Chose dry sanitation options such as a dehydrating toilets, instead of wet ones such as septic tanks or detention ponds (P&D)
Facility is or will include a water supply improvement (Also consult "Small-scale water projects" in this volume)	Deplete ground and/or surface water resources and damage local ecosystems or down stream/down-gradient communities Poison users with natural or manmade chemical contaminants such as arsenic Spread disease with pathogenic contaminants Cause groundwater contamination	Determine safe yield and establish system for regulating use (P&D) (O&M) Test seasonal water quality and examine historical water quality data before building facility (SS) (P&D) Incorporate siting, design features, and operation and maintenance practices that minimize environmental impacts described in "Water Supply and Sanitation" in this volume. Includes practices such as community participation, fee for service pricing, preventing livestock grazing near water supply, etc. (SS) (P&D) (C) (O&M)

Issue or aspect of activity	Impact *The activity may. . .*	Mitigation *Note: Mitigations apply to specified project phase: Site Selection (SS); Planning and design (P&D), Construction (C), or Operation and Maintenance (O&M)*
Facility is or will include a sanitation improvement (Also consult "Small-scale water projects" in this volume)	Discharge untreated or insufficiently treated sewage that: • Contaminates drinking water (ground and surface) • Spreads diseases • Degrades aquatic ecosystems	Do not site in wetland or next to stream, river, lake or well (SS) Do not site up-gradient from drinking water source such as a well, if possible (SS) Do not site where water table is high or underlying geology makes contamination of groundwater likely. Alternately, choose dry sanitation options such as a dehydrating toilet in a sealed vault instead of wet ones such as septic tanks or detention ponds (SS) (P&D) Incorporate design features, education/social marketing programs, construction and operation and maintenance practices described in "Water Supply and Sanitation" in this volume and resources listed there, practices such as community participation, sanitation promotion focusing on women and children, use of appropriate natural treatment systems, etc. (SS) (P&D) (C) (O&M)
Facility will provide healthcare services	Spread disease via failure to (1) sterilize infectious waste and/or (2) prevent access to waste by waste pickers or disease vectors Expose local community to health risks via unsafe disposal of toxic, carcinogenic, and teratogenic materials Contaminate drinking water (ground and/or surface) via Improper land disposal. (May also damage local ecosystems, animals or plants.)	Do not site in wetland or next to stream, river, lake or well (SS) Incorporate design features, and operation and maintenance procedures, described in "Healthcare waste: Generation, handling, treatment and disposal" in this volume. Includes elements such as hand washing facilities, a waste storage room, an incinerator (if rural), a space for encapsulation, and a plastic/clay lined pit for safe burial (SS) (P&D) (C) (O&M). Among the most important guidelines from this section: • If waste will be buried on site, if possible do not site burial pit up-gradient from drinking water source such as a well,. Pit must be lined with impermeable material such as clay or polyethylene (SS) (P&D) (C) • If waste will be buried on site, if possible do not site where water table is high or underlying geology makes contamination of groundwater likely. If no alternative site is available, ensure that pit is lined with impermeable material such as clay or polyethylene (SS) (P&D) (C) • Provide for safe disposal of gray water from bathing and washing of bedding, etc. (P&D; O&M) • Ensure that the system of human waste disposal provided minimizes health risks. (P&D; O&M) • Ensure that water is provided to the facility in a manner that minimizes risk of contamination for patients and nearby communities. (P&D; O&M)

Issue or aspect of activity	Impact *The activity may. . .*	Mitigation *Note: Mitigations apply to specified project phase: Site Selection (SS); Planning and design (P&D), Construction (C), or Operation and Maintenance (O&M)*
Facility will generate solid waste	Spread disease Contaminate drinking water (ground and surface) Degrade aquatic ecosystems Generate greenhouse gases	Include space and features for source separation of recyclables and organic waste. Consider including space and/or constructing a compost bin or wormbox if facility will produce organic waste (P&D) (C) (O&M)
Facility will house automotive, laboratory or other industrial activities	Expose workers or local population to toxic, carcinogenic, and teratogenic materials such as heavy metals, oil, lubricants, batteries, dyes, glue, solvents, acids, etc. Contaminate drinking water (ground and surface) Damage local ecosystems, animals or plants	Do not site near wetlands or bodies of water (SS) Design with proper storage, handling and treatment facilities (SS) (P&D) (C) (O&M)
Facility will generate cooling waters, soaking waters, or water containing suspended organic mater, mercury, lead, soaps, etc.	Expose workers or local population to toxic, carcinogenic, and teratogenic materials Contaminate drinking water (ground and surface) Damage local ecosystems, animals or plants	Incorporate cleaner production technologies into design, operation and maintenance described in "Activities with Micro and Small Enterprises (MSEs)" in this volume and resources listed there (SS) (P&D) (C) (O&M) Design with elements for storage, treatment and discharge of wastewater (P&D) (O&M)
Indirect effects	Damage or destroy natural resources Increase in-migration Damage local social and cultural integrity Facilitate spread of disease to both people and animals	Research indirect effects that may be associated with the particular type of facility being built and evaluate other possible impacts of this type. If the project falls into one of the sectors covered is this volume, the relevant sector briefing and the resources listed therein are excellent starting points for this research (SS) (P&D) (C) (O&M)
Cumulative effects of one development project over time or many small developments built within as short time period	Cause excessive extraction of building materials, multiply impacts associated with logging un-degraded forest, quarrying and borrowing (see below for more detail)	Develop logging, quarrying and borrowing plans that take into account cumulative effects and include reclamation plans (P&D) Monitor adherence to plans and impacts of extraction practices. Modify as necessary (C) (O&M)

Issue or aspect of activity	Impact *The activity may. . .*	Mitigation *Note: Mitigations apply to specified project phase: Site Selection (SS); Planning and design (P&D), Construction (C), or Operation and Maintenance (O&M)*
Construction		
Construction crews and camps	Damage local habitat, compact soil and create erosion via building and occupation of construction camps Contaminate surface water and spread disease via solid waste and feces generated by camps Spread communicable diseases including malaria, tuberculosis, and HIV/AIDS via construction crews who come from outside the region. Introduce alcohol or other socially destructive substances via construction crews Deplete local animals and plants (especially game and fuelwood) via poaching and collection by the construction crew	Explore off-site accommodation for crew (P&D) (C) Keep camp size to a minimum. Require that crew preserve as much vegetation as possible, e.g., by creating defined foot paths (P&D) (C) Provide temporary sanitation on site, e.g., pit latrine (assuming the water table is low enough and soil and geology of appropriate composition) (P&D) (C) Use local or regional labor, if possible. Screen potential crew members for HIV/AIDS and tuberculosis. Provide education,and strict guidelines regarding contact with local residents, and enforce guidelines (P&D) (C) Set guidelines prohibiting poaching and collection of plants/wood with meaningful consequences for violation such as termination of employment. Provide adequate quantities and good quality food and cooking fuel (C)
Use of heavy equipment and hazardous materials	Cause erosion due to machinery tracks, damage to roads, stream banks, etc Compact soil, changing surface and groundwater flows and damaging future use for agriculture Contaminate ground or surface water when (1) machinery repairs result in spills or dumping of hydraulic oil, motor oil or other harmful mechanical fluids; and (2) when hazardous construction materials are spilled or dumped Put workers at risk from exposure to hazardous materials Generate excessive noise levels that impact both the surrounding community as well as health and safety of workers	Minimize use of heavy machinery (P&D) (C) Set protocols for vehicle maintenance such as requiring that repairs and fueling occur elsewhere or over impervious surface such as plastic sheeting. Prevent dumping of hazardous materials. Burn waste materials that are not reusable/readily recyclable, do not contain heavy metals and are flammable (P&D) (C) Investigate and use less toxic alternative products (P&D) (C) Ensure workers follow proper health and safety guidelines for wearing hearing protection devices

Issue or aspect of activity	Impact *The activity may. . .*	Mitigation *Note: Mitigations apply to specified project phase: Site Selection (SS); Planning and design (P&D), Construction (C), or Operation and Maintenance (O&M)*
Demolition of existing structures	Bother or endanger neighbors via noise, dust, and debris from demolition Contaminate soil, ground or surface water from demolition waste containing residual amounts of toxic materials (e.g.,leaded paint)	Recover all reusable material (this may be the standard procedure in many developing countries) (P&D) (C) Determine whether toxic materials are present. If so, dispose of waste in lined landfill, if possible. Otherwise, explore options for reuse in areas where potential for contamination of surface and ground water are small (e.g.,use as roadbed material may be feasible under such circumstances). (See the "Management of solid waste from residential, commercial and industrial facilities" in this volume and references listed there for a more information) (P&D) (C)
Site clearing and/or leveling	Damage or destroy sensitive terrestrial ecosystems in the course of site clearing/preparation Produce areas of bare soil which cause erosion, siltation, changes in natural water flow, and/or damage to aquatic ecosystems Creation of local dust problems	Design facility so that it will create least impact (P&D) Minimize disturbance of native flora during construction (P&D) (C) Remove without destroying large plants and turf where possible (P&D) (C) Use erosion control measures such as hay bales (C) Replant recovered plants and other appropriate local flora as soon as possible (C) Periodically water down dusty site areas (C)
Excavation	Cause erosion, siltation, changes in natural water flow, and/or damage to aquatic ecosystems when excavated soil is piled inappropriately Expose inhabitants and crew to risk of falls and injuries in excavation pits. Deprive down-gradient populations and ecosystems of water if higher regions of aquifer are blocked	Cover pile with plastic sheeting, prevent run-off with hay bales, or similar measures (P&D) (C) Place fence around excavation (P&D) (C) Investigate shallower excavation/no excavation alternatives (P&D)
Filling	Block water courses when fill is inappropriately placed Destroy valuable ecosystems when fill is inappropriately placed Result in land subsidence or landslides later if fill is inappropriately placed, causing injuries or damage.	Do not fill the flow-line of a watershed. Be aware that in arid areas, occasional rains may create strong water flows in channels. A culvert may not supply adequate capacity for rare high volume events (SS) (P&D) Design so that filling will not be necessary. Transplant as much vegetation and turf as possible (SS) (P&D) (C) Use good engineering practices. (e.g., do not use soil alone. First lay a bed of rock and gravel) (P&D) (C)

Issue or aspect of activity	Impact *The activity may. . .*	Mitigation *Note: Mitigations apply to specified project phase: Site Selection (SS); Planning and design (P&D), Construction (C), or Operation and Maintenance (O&M)*
Road improvement/new road construction (Consult "Rural Roads" in this volume and resources listed there)	Erosion and changes to water quality and natural water flows via poor road construction practices and maintenance Provide access for mining, logging, poaching, settlement or other development that destroys natural resources and/or harm local populations May lead to the spread of human or livestock disease	Find alternative site. Evaluate whether an alternative mode of transport would suffice (e.g., rail, water, or footpath). (SS) (P&D) Adhere to specifications for road design and maintenance that keep water off road surfaces (P&D) (C) (O&M) Follow best practices for design, construction, and operation and maintenance described in "Rural Roads" in this volume and resources listed there. These include practices such as developing quarry and borrow pit plans, following the contour line, using camber and turnout drains, training operations and maintenance personnel, etc. (SS)(P&D) (C) (O&M)
Source of building materials	Damage aquatic ecosystems through erosion and siltation Harm terrestrial ecoystems via harvesting of timber or other natural products Spread vector-borne diseases when stagnant water accumulates in active or abandoned quarries or borrow pits and breeds insect vectors	Identify the most environmentally sound source of materials that is within budget Develop logging, quarrying and borrowing plans that take into account cumulative effects (P&D) Monitor adherence to plans and impacts of extraction practices. Modify as necessary (C) (O&M) Fill in quarries and pits before abandoning (C) Control runoff into pit (C)

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RESOURCES AND REFERENCES

CIDA "Checklist #2 / Building Construction" (1997). *Handbook on Environmental Assessment of Non-Governmental Organizations and Institutions Programs and Practices.* Canadian International Development Agency. http://www.acdi-cida.gc.ca/search-e.htm

Tsunokawa, Koji and Christopher Hoban (Eds.) (1997) *Roads and the Environment: A Handbook.* Wold Bank Technical Paper No. 376. World Bank, Washington, D.C. http://www-wds.worldbank.org/pdf_content/000094946001018053216 87/multi_page.pdf

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SITE DESCRIPTION AND INFORMATION SURVEY

This Site Description and Information Survey Form is intended to assist you in obtaining and recording information regarding the project site. This survey should be conducted with a site map in hand. This form will help you describe the site as well as identify potential risk areas and environmental sensitive areas. This form has been developed as a checklist to help prompt you to identify important information that is needed for developing a TESC plan. Much of the information may be obtained while still in the office but it is essential to verify all information in the field. ***Each of the following categories of information should be identified and assessed.***

Project Information

Name of Project: _____

Date: _____

Recent Weather Conditions: _____

Soil Type: Check the soil type (or combination of types) that best describes the soil found on site, or give the soil classification (if known). Describe the soil, if necessary.

❑ Gravel ❑ Gravelly Sands/Sandy Gravels ❑ Sand ❑ Silty Sands/Sandy Silts

❑ Silt ❑ Clay ❑ Peat

Soil Classification (if known): _____

Jar Test Results: _____

Slope Stability: _____

Infiltration Area: _____

Topography: Area Wide Topography: _____

General Site Basin or Slope Direction: _____

Cut and Fill Slopes: _____

Other: _____

Drainage Features: Check the drainage features that are on site. Describe if necessary:

Existing Runoff (ditches, streams): _____

Runoff from impervious surfaces: _____

Temporary conveyances: _____

Final conveyances: _____

Surface: Describe the surfaces on the site (paved, gravel, vegetated). Note locations of paved/unpaved areas and approximate sizes (if applicable) on your site map.
❑ Gravel/Soil ❑ Vegetated/Undeveloped ❑ Capped/Paved (asphalt/concrete)

_____

_____

_____

Adjacent Properties:

Potential impacts from upgradient properties: _____

Potential impacts to downgradient properties: _____

Groundwater:

Record the depth to groundwater (if known), or depth at which groundwater is expected to be encountered.

Depth to groundwater (known or suspected): _____

Seeps and springs: _____

Low areas with seasonal flooding or high water table: _____

Surface Water Bodies: Check all surface water bodies that are on site or adjacent to the site. Describe if necessary.

❑ Lakes, ponds
❑ Rivers, streams, creeks
❑ Wetlands, swamp
❑ None
❑ Other_____

_____

_____

_____

_____

Table 2.5
Site Erosion Risk Checklist

Inherent Level of Risk Associated with a Site	Low	Medium	High	Comments
Soil-related risks				
How erodible is the soil?				
What is the potential for slides?				
What is the expected turbidity from exposed areas?				
Would detention NOT remove sediment from runoff?				
Do soils lend to high or low runoff volumes?				
What is the potential for dust problems?				
What level of effort would be needed to reestablish vegetation?				
Weather				
Total rainfall?				
Intensity of rainfall events?				
Probability of rainfall?				
Probability of rain on snow events?				
Intensity/frequency of erosive winds?				
Topography				
Size, gradient and stability of slopes in work area?				
Size, gradient and stability of slopes above or below the work area?				
What is the potential to trap and treat runoff in natural depressions of flat vegetated areas?				
Flowing Water?				
Likelihood that surface runoff could cause concentrated flows?				
Likelihood that runoff from impervious surfaces could damage grades and/or water quality?				
How difficult would it be to intercept and divert runoff from impervious surfaces?				
Likelihood of potentially damaging offsite runoff flowing into the construction area?				
How difficult would it be to intercept and divert offsite runoff?				
Potential of offsite water overwhelming detention facilities and conveyances?				
Probability of water damaging conveyances?				
Groundwater				
Probability of intercepting potentially damaging groundwater seeps and springs?				
Potential of groundwater impacting detention areas and pond effectiveness that would delay construction, and reduce BMP effectiveness?				
Potential for slope failures due to groundwater seeps?				
Probability of encountering a seasonal high water table?				
Level of difficulty to de-water?				
Probability of budget problems and cost overruns due to groundwater?				
Sensitive Areas				
Likelihood that runoff could impact to State waters (streams or wetlands)?				
Likelihood that runoff could impact ESA listed fish?				
Potential for damage to adjacent properties?				
Potential for impacts from other neighboring construction projects (trackout, poor BMPs)?				

Table 3.4
Physical Control BMP Selection Guide Based on Potential Problems

#	POTENTIAL PROBLEM SITUATION (Reminder: all erosion BMPs help prevent sediment problems)	RECOMMENDED BMPS
1	Erosion due to rainfall on exposed soils	Preserving Vegetation, Track Walking, Straw, Mulching & Matting, PAM, Temporary Seeding, Hydroseed/Mulch spray mixture, Bonded Fiber Matrix, Plastic, Sodding, Topsoiling, Permanent Seeding and Planting
2	Erosion due to rainfall on short or low gradient exposed slopes	Preserving Vegetation, Track Walking, Straw, Mulching & Matting, PAM, Temporary Seeding, Hydroseed/Mulch spray mixture, Bonded Fiber Matrix, Plastic, Sodding, Topsoiling, Permanent Seeding and Planting
3	Erosion due to long or steep exposed slopes	Preserving Vegetation, Track Walking, Gradient Terraces, Straw, Mulching & Matting, PAM, Temporary Seeding, Hydroseed/Mulch spray mixture, Bonded Fiber Matrix, Plastic, Sodding, Topsoiling, Permanent Seeding and Planting Conveyance – Interceptor Dike and Swale, Pipe Slope Drains
4	Erosion due to concentrated runoff from impervious surfaces flowing onto exposed slopes	Interceptor Dike and Swale, Pipe Slope Drains
5	Erosion due to offsite water running onto exposed slopes as either concentrated flow or sheet runoff	Pipe Slope Drains, Interceptor Dike and Swale
6	Erosion in ditches due to high velocity flows	Check Dams, Sodding, Matting, Rip-Rap Channel Lining, Level Spreader
7	Sediment-laded water leaving the site as sheet flow	Filter Fence, Straw Bale Barrier, Brush Barrier, Gravel Filter Berm
8	Sediment–laden water entering the storm drain	Storm Drain Inlet Protection and New Products, Stabilized Construction Entrance & Tire Wash, Construction Road Stabilization, Early First Asphalt Lift or Gravel Bedding in Areas to be Paved
9	Sediment-laden water leaving the site as concentrated flow	Sediment Trap, Temporary Sediment Pond, Outlet Protection, Chemical Stormwater Treatment
10	Tracking of sediment onto roadways	Stabilized Construction Entrance & Tire Wash, Street Sweeper, Early First Asphalt Lift or Gravel Bedding in areas to be paved, Maintenance of Construction Entrance
11	Discharges of concentrated, high velocity flows causing erosion	Level Spreader, Temporary Sediment Pond, Outlet Protection

[a] When a variety of alternative BMPs can be used to solve a particular problem, refer to the Highway Runoff Manual and Ecology's Stormwater Management Manual for guidance to select the preferred BMP.

PART 1 OF THE SCOPING CHECKLIST: QUESTIONS ON PROJECT CHARACTERISTICS

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in waterbodies, etc)?				
1.1	Permanent or temporary change in land use, landcover or topography including increases in intensity of land use?			
1.2	Clearance of existing land, vegetation and buildings?			
1.3	Creation of new land uses?			
1.4	Pre-construction investigations eg boreholes, soil testing?			
1.5	Construction works?			
1.6	Demolition works?			
1.7	Temporary sites used for construction works or housing of construction workers?			
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations?			
1.9	Underground works including mining or tunnelling?			
1.10	Reclamation works?			
1.11	Dredging?			
1.12	Coastal structures *eg* seawalls, piers?			
1.13	Offshore structures?			
1.14	Production and manufacturing processes?			
1.15	Facilities for storage of goods or materials?			
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?			
1.17	Facilities for long term housing of operational workers?			

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
1.18	New road, rail or sea traffic during construction or operation?			
1.19	New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?			
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?			
1.21	New or diverted transmission lines or pipelines?			
1.22	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?			
1.23	Stream crossings?			
1.24	Abstraction or transfers of water from ground or surface waters?			
1.25	Changes in waterbodies or the land surface affecting drainage or run-off?			
1.26	Transport of personnel or materials for construction, operation or decommissioning?			
1.27	Long term dismantling or decommissioning or restoration works?			
1.28	Ongoing activity during decommissioning which could have an impact on the environment?			
1.29	Influx of people to an area in either temporarily or permanently?			
1.30	Introduction of alien species?			
1.31	Loss of native species or genetic diversity?			
1.32	Any other actions?			
2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply?				
2.1	Land especially undeveloped or agricultural land?			
2.2	Water?			
2.3	Minerals?			

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
2.4	Aggregates?			
2.5	Forests and timber?			
2.6	Energy including electricity and fuels?			
2.7	Any other resources?			
3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?				
3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, water supplies)?			
3.2	Will the project result in changes in occurrence of disease or affect disease vectors (eg insect or water borne diseases)?			
3.3	Will the project affect the welfare of people eg by changing living conditions?			
3.4	Are there especially vulnerable groups of people who could be affected by the project eg hospital patients, the elderly?			
3.5	Any other causes?			
4. Will the Project produce solid wastes during construction or operation or decommissioning?				
4.1	Spoil, overburden or mine wastes?			
4.2	Municipal waste (household and or commercial wastes)?			
4.3	Hazardous or toxic wastes (including radioactive wastes)?			
4.4	Other industrial process wastes?			
4.5	Surplus product?			
4.6	Sewage sludge or other sludges from effluent treatment?			
4.7	Construction or demolition wastes?			
4.8	Redundant machinery or equipment?			

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
4.9	Contaminated soils or other material?			
4.10	Agricultural wastes?			
4.11	Any other solid wastes?			
5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources?			
5.2	Emissions from production processes?			
5.3	Emissions from materials handling including storage or transport?			
5.4	Emissions from construction activities including plant and equipment?			
5.5	Dust or odours from handling of materials including construction materials, sewage and waste?			
5.6	Emissions from incineration of waste?			
5.7	Emissions from burning of waste in open air (*eg* slash material, construction debris)?			
5.8	Emissions from any other sources?			
6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?				
6.1	From operation of equipment eg engines, ventilation plant, crushers?			
6.2	From industrial or similar processes?			
6.3	From construction or demolition?			
6.4	From blasting or piling?			
6.5	From construction or operational traffic?			
6.6	From lighting or cooling systems?			

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
6.7	From sources of electromagnetic radiation (consider effects on nearby sensitive equipment as well as people)?			
6.8	From any other sources?			
7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters, groundwater, coastal waters or the sea?				
7.1	From handling, storage, use or spillage of hazardous or toxic materials?			
7.2	From discharge of sewage or other effluents (whether treated or untreated) to water or the land?			
7.3	By deposition of pollutants emitted to air, onto the land or into water?			
7.4	From any other sources?			
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?			
8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?				
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous or toxic substances?			
8.2	From events beyond the limits of normal environmental protection eg failure of pollution control systems?			
8.3	From any other causes?			
8.4	Could the project be affected by natural disasters causing environmental damage (*eg* floods, earthquakes, landslip, *etc*)?			
9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?				
9.1	Changes in population size, age, structure, social groups *etc*?			
9.2	By resettlement of people or demolition of homes or communities or community facilities eg schools, hospitals, social facilities?			
9.3	Through in-migration of new residents or creation of new communities?			
9.4	By placing increased demands on local facilities or services eg housing, education, health?			
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?			
9.6	Any other causes?			

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
Question - Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?				
9.1	Will the project lead to pressure for consequential development which could have significant impact on the environment eg more housing, new roads, new supporting industries or utilities, etc?			
9.2	Will the project lead to development of supporting facilities, ancillary development or development stimulated by the project which could have impact on the environment eg: • supporting infrastructure (roads, power supply, waste or waste water treatment, etc) • housing development • extractive industries • supply industries • other?			
9.3	Will the project lead to after-use of the site which could have an impact on the environment?			
9.4	Will the project set a precedent for later developments?			
9.5	Will the project have cumulative effects due to proximity to other existing or planned projects with similar effects?			

PART 2 OF THE SCOPING CHECKLIST: CHARACTERISTICS OF THE PROJECT ENVIRONMENT

For each project characteristic identified in Part consider whether any of the following environmental components could be affected.

Question - Are there features of the local environment on or around the Project location which could be affected by the Project?
• Areas which are protected under international or national or local legislation for their ecological, landscape, cultural or other value, which could be affected by the project?
• Other areas which are important or sensitive for reasons of their ecology e.g.
  • Wetlands,
  • Watercourses or other waterbodies,
  • the coastal zone,
  • mountains,
  • forests or woodlands
• Areas used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the project?
• Inland, coastal, marine or underground waters?
• Areas or features of high landscape or scenic value?
• Routes or facilities used by the public for access to recreation or other facilities?
• Transport routes which are susceptible to congestion or which cause environmental problems?
• Areas or features of historic or cultural importance?

Question - Is the Project in a location where it is likely to be highly visible to many people?
Question - Is the Project located in a previously undeveloped area where there will be loss of greenfield land?
Question - Are there existing land uses on or around the Project location which could be affected by the Project? For example: • Homes, gardens, other private property, • Industry, • Commerce, • Recreation, • public open space, • community facilities, • agriculture, • forestry, • tourism, • mining or quarrying
Question - Are there any plans for future land uses on or around the location which could be affected by the Project?
Question - Are there any areas on or around the location which are densely populated or built-up, which could be affected by the Project?
Question - Are there any areas on or around the location which are occupied by sensitive land uses which could be affected by the Project? • hospitals, • schools, • places of worship, • community facilities
Question - Are there any areas on or around the location which contain important, high quality or scarce resources which could be affected by the Project? For example: • groundwater resources, • surface waters, • forestry, • agriculture, • fisheries, • tourism, • minerals.
Question - Are there any areas on or around the location of the Project which are already subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project?

Question - Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the project to present environmental problems?
Question - Is the Project likely to affect the physical condition of any environmental media? • The atmospheric environment including microclimate and local and larger scale climatic conditions? • Water - eg quantities, flows or levels of rivers, lakes, groundwater. Estuaries, coastal waters or the sea? • Soils - eg quantities, depths, humidity, stability or erdodibility of soils? • Geological and ground conditions?
Question - Are releases from the Project likely to have effects on the quality of any environmental media? • Local air quality? • Global air quality including climate change and ozone depletion • Water quality – rivers, lakes, groundwater. Estuaries, coastal waters or the sea? • Nutrient status and eutrophication of waters? • Acidification of soils or waters? • Soils • Noise? • Temperature, light or electromagnetic radiation including electrical interference? • Productivity of natural or agricultural systems?
Question - Is the Project likely to affect the availability or scarcity of any resources either locally or globally? • Fossil fuels? • Water? • Minerals and aggregates? • Timber? • Other non-renewable resources? • Infrastructure capacity in the locality - water, sewerage, power generation and transmission, telecommunications, waste disposal roads, rail?
Question - Is the Project likely to affect human or community health or welfare? • The quality or toxicity of air, water, foodstuffs and other products consumed by humans? • Morbidity or mortality of individuals, communities or populations by exposure to pollution? • Occurrence or distribution of disease vectors including insects? • Vulnerability of individuals, communities or populations to disease? • Individuals' sense of personal security? • Community cohesion and identity? • Cultural identity and associations? • Minority rights? • Housing conditions? • Employment and quality of employment? • Economic conditions? • Social institutions?

CHECKLIST OF CRITERIA FOR EVALUATING THE SIGNIFICANCE OF IMPACTS

Instructions for Scoping

This checklist is designed to help users decide whether or not an impact is likely to be significant and is to be used in conjunction with the Scoping Checklist.

The Scoping Checklist provides a list of questions to help identify where there is the potential for interactions between a project and its environment. This checklist is designed to help decide whether those interactions - effects - are likely to be significant.

Those responsible for scoping often find difficulties in defining what is "significant". A useful simple check is to ask whether the effect is one that ought to be considered and to have an influence on the development consent decision. At the early stages of a project there is likely to be little information on which to base this decision but the following list of questions may be helpful.

The questions to be asked are the same as in Screening but at the Scoping stage it is important to provide as much information as possible on why the effect is considered likely to be significant, rather than a simple "yes/no" answer.

Questions to be Considered

1. Will there be a large change in environmental conditions?
2. Will new features be out-of-scale with the existing environment?
3. Will the effect be unusual in the area or particularly complex?
4. Will the effect extend over a large area?
5. Will there be any potential for transfrontier impact?
6. Will many people be affected?
7. Will many receptors of other types (fauna and flora, businesses, facilities) be affected?
8. Will valuable or scarce features or resources be affected?
9. Is there a risk that environmental standards will be breached?
10. Is there a risk that protected sites, areas, features will be affected?
11. Is there a high probability of the effect occurring?
12. Will the effect continue for a long time?
13. Will the effect be permanent rather than temporary?
14. Will the impact be continuous rather than intermittent?
15. If it is intermittent will it be frequent rather than rare?
16. Will the impact be irreversible?
17. Will it be difficult to avoid, or reduce or repair or compensate for the effect?

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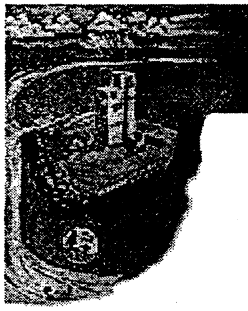

Louisiana Department of Environmental Quality
Nonpoint Source Pollution Program

Construction Best Management Practices

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Nonpoint News

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Data Information Mangement System (documents)

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Public Participation

Upcoming Events

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The following items are best management practices that will help reduce nonpoint source pollution related to construction activites.

Diversion Dikes
Diversion dikes should be built at the upslope perimeter of the construction site to channel rain water away from the disturbed area. The divesrion dikes should be built prior to any earth moving, and should be seeded and mulched immediately after they are built.

Vegetative Buffer Strips
Of primary importance when construction sites are adjacent to water bodies, a buffer strip of undisturbed vegetation between the water body and the construction area reduces run-off water velocity and traps sediment. This reduces sediment delivery to surface waters and adjacent properties.

Seeding and Mulching
Mulch should be applied to exposed soil at the end of each work day. Seed should be applied to topsoil stockpiles and bare soil after use of soil and disturbances to the soil have stopped.

Hay Bale Dikes
Hay bale dikes are very cost effective as short-term sediment traps. They can be located across slopes, at the foot of slopes, along stream banks, and in small drainage ditches that occasionally carry sediment-laden water.

Silt Fencing
Sediment fencing is temporary filter-cloth fencing that is used to catch sediment-laden run-off from small areas of soil disturbance. This usually reduces run-off velocity to a degree favorable for sediment deposition.

Vegetative Cover
Natural vegetation controls erosion in several ways. It protects the soil surface from the impact of falling rain and decreases the velocity of run-off. It helps maintain the soil's capacity to absorb water and holds soil particles in place. A construction planner can significantly reduce soil erosion and sedimentation by limiting the removal of vegetation. If removal is necessary, it should be done in stages to decrease the duration of soil exposure. Vegetation should be retained in areas of moderate to high soil erosion potential, such as steep slopes, drainage ways, highly erodible soils, and stream banks.

Sediment Basin
A sediment basin is a temporary dam constructed across a drainageway to intercept and retain sediment and other waterborne debris. It provides a temporary means of detaining sediment-laden run-off long enough for the majority of sediment to settle out. Special consideration needs to be given on depth of water table when this practice is used in order to ensure that infiltration of pollutants do not contaminate ground water aquifers.

Sediment Trap
A sediment trap is a small temporary ponding area formed by constructing an earthen embankment to intercept sediment-laden run-off from a small disturbed area long enough to trap and retain it to settle out. This practice should be installed at points of discharge from disturbed areas for a maximum period of 18 months. Special consideration needs to be given on depth of water table when this practice is used in order to ensure that infiltration of pollutants do not contaminate groundwater aquifers.

Agricultural BMPs | Construction BMPs
Septic Tanks BMPs | Forestry BMPs | Urban Run-off BMPs

Home | Main Web Directory | Program Strategies | Upcoming Events

Checklist for Urban Development (Building Construction) Projects

Aspects of EIA	Checklist Questions Will the project:	Yes	No	Additional Data needs
Sources of Impacts	1. Require the acquisition or utilisation of a significantly large area of land (eg > 5 hectares)?	☐	☐	☐
	2. Result in significant quantities of eroded materials, domestic refuse or effluent?	☐	☐	☐
	3. Require significant accommodation or service amenities to support the workforce during construction (eg > 100 manual labourers)?	☐	☐	☐
	4. During project design, exceed the capacity of the existing water supply and sanitation system to accommodate its sewage, waste treatment and disposal requirements?	☐	☐	☐
Receptors of Impacts	5. Be located in (or require the routing of associated infrastructure through) areas that support sites or monuments of historical or cultural importance?	☐	☐	☐
	6. Require the resettlement or compensation of local people?	☐	☐	☐
	7. Use space previously reserved for parks, playgrounds or greenbelts?	☐	☐	☐
	8. Once operational, conflict with existing regional water extraction (eg by other communities or agriculture)?	☐	☐	☐
Environmental Impacts	9. During construction, present a significant pollution hazard to workers and local communities (eg dust, fumes, accidents with hazardous materials)?	☐	☐	☐
	10. Significantly affect, positively or negatively, land values adjacent to the project site (eg > 10%, or require provision of financial compensation)?	☐	☐	☐
	11. Once operational, present a significant pollution risk to potable water supplies, or significantly reduce the waste absorption capacity of downstream water courses?	☐	☐	☐
Mitigation Measures	12. Require competent health and safety staff with a separate, minimum budget?	☐	☐	☐
	13. Be likely to require mitigation measures that may result in the project being financially or socially unacceptable?	☐	☐	☐
Comments				
	I recommend that the programme be assigned to Category ☐			
	Signature: Delegation.....Desk.....			

Assessment Matrix: Site Development

	Environmental Effects / Development	Foundations Earthworks Water Supply - Treatment on site	Energy Supply on Site - Electricity - Gas - Oil - Other	Traffic - Construction - Other	Discharges - Gaseous - Liquid - Solid - Stormwater - Silt - Sewage
BIOLOGICAL ENVIRONMENT	Forest				
	Shrubland				
	Grassland				
	Herbfield (alpine)				
	Sand/shingle/rock				
	Cropland				
	Urban land				
	Lakes				
	Rivers				
	Estuaries				
	Inter-tidal				
	Marine				
	Wetlands				
PHYSICAL ENVIRONMENT	River regime				
	Erosion/land stability				
	Sedimentation				
	Surface water				
	Ground water				
	Agricultural soil				
	Foundation materials				
	Climate/atmosphere				
	Nuisance (noise, dust, smell)				
	Landform				
SOCIAL ENVIRONMENT	Public participation				
	Employment				
	Settlement				
	Land value				
	Existing land uses				
	Risks and anxieties				
	Personal and social values				
	Historical/cultural				
	Landscape/visual				
	Recreation				

HSE
Health & Safety Executive

Construction health and safety checklist

Construction Sheet No 17 (revised)

This checklist identifies some of the hazards most commonly found on construction sites. The questions it asks are intended to help you decide whether your site is a safe and healthy place to work. **It is not an exhaustive list.** More detailed information can be found in HSG150 *Health and safety in construction* and other HSE publications.

Safe places of work

- Can everyone reach their place of work safely, eg are roads, gangways, passageways, passenger hoists, staircases, ladders and scaffolds in good condition?
- Are there guard rails or equivalent protection to stop falls from open edges on scaffolds, mobile elevating work platforms, buildings, gangways, excavations, etc?
- Are holes and openings securely guard railed, provided with an equivalent standard of edge protection or provided with fixed, clearly marked covers to prevent falls?
- Are structures stable, adequately braced and not overloaded?
- Are all working areas and walkways level and free from obstructions such as stored material and waste?
- Is the site tidy, and are materials stored safely?
- Are there proper arrangements for collecting and disposing of waste materials?
- Is the work adequately lit? Is sufficient additional lighting provided when work is carried on after dark or inside buildings?

Scaffolds

- Are scaffolds erected, altered and dismantled by competent persons?
- Is there safe access to the scaffold platform?
- Are all uprights provided with base plates (and, where necessary, timber sole plates) or prevented in some other way from slipping or sinking?
- Are all the uprights, ledgers, braces and struts in position?
- Is the scaffold secured to the building or structure in enough places to prevent collapse?
- Are there adequate guard rails and toe boards or an equivalent standard of protection at every edge from which a person could fall 2 m or more?
- Where guard rails and toe boards or similar are used:
  - are the toe boards at least 150 mm in height?
  - is the upper guard rail positioned at a height of at least 910 mm above the work area?
  - are additional precautions, eg intermediate guard rails or brick guards in place to ensure that there is no unprotected gap of more than 470 mm between the toe board and upper guard rail?
- Are the working platforms fully boarded and are the boards arranged to avoid tipping or tripping?
- Are there effective barriers or warning notices in place to stop people using an incomplete scaffold, eg where working platforms are not fully boarded?
- Has the scaffold been designed and constructed to cope with the materials stored on it and are these distributed evenly?
- Does a competent person inspect the scaffold regularly, eg at least once a week; always after it has been substantially altered, damaged and following extreme weather?
- Are the results of inspections recorded?

Powered access equipment

- Has the equipment been erected by a competent person?
- Is fixed equipment, eg mast climbers, rigidly connected to the structure against which it is operating?
- Does the working platform have adequate guard rails and toe boards or other barriers to prevent people and materials falling off?
- Have precautions been taken to prevent people being struck by the moving platform, projections from the building or falling materials, eg barrier or fence around the base?
- Are the operators trained and competent?
- Is the power supply isolated and the equipment secured at the end of the working day?

Ladders

- Are ladders the right means of access for the job?
- Are all ladders in good condition?
- Are they secured to prevent them slipping sideways or outwards?
- Do ladders rise a sufficient height above their landing place? If not, are there other hand-holds available?
- Are the ladders positioned so that users don't have to over-stretch or climb over obstacles to work?
- Does the ladder rest against a solid surface and not on fragile or insecure materials?

Roof work

- Are there enough barriers and is there other edge protection to stop people or materials falling from roofs?
- Do the roof battens provide safe hand and foot holds? If not, are crawling ladders or boards provided and used?
- During industrial roofing, are precautions taken to stop people falling from the leading edge of the roof or from fragile or partially fixed sheets which could give way?
- Are suitable barriers, guard rails or covers, etc provided where people pass or work near fragile material such as asbestos cement sheets and roof lights?
- Are crawling boards provided where work on fragile materials cannot be avoided?
- Are people excluded from the area below the roof work? If this is not possible, have additional precautions been taken to stop debris falling onto them?

Excavations

- Is an adequate supply of timber, trench sheets, props or other supporting material made available before excavation work begins?
- Is this material strong enough to support the sides?
- Is a safe method used for putting in the support, ie one that does not rely on people working within an unsupported trench?
- If the sides of the excavation are sloped back or battered, is the angle of batter sufficient to prevent collapse?
- Is there safe access to the excavation, eg by a sufficiently long, secured ladder?
- Are there guard rails or other equivalent protection to stop people falling in?
- Are properly secured stop blocks provided to prevent tipping vehicles falling in?
- Does the excavation affect the stability of neighbouring structures?
- Are materials, spoil or plant stored away from the edge of the excavation in order to reduce the likelihood of a collapse of the side?
- Is the excavation inspected by a competent person at the start of every shift; and after any accidental collapse or event likely to have affected its stability?

Manual handling

- Has the risk of manual handling injuries been assessed?
- Are hoists, telehandlers, wheel-barrows and other plant or equipment used so that manual lifting and handling of heavy objects is kept to a minimum?
- Are materials such as cement ordered in 25 kg bags?
- Can the handling of heavy blocks be avoided?

Hoists

- Is the hoist protected by a substantial enclosure to prevent someone from being struck by any moving part of the hoist or falling down the hoistway?
- Are gates provided at all landings, including ground level?
- Are the gates kept shut except when the platform is at the landing?
- Are the controls arranged so that the hoist can be operated from one position only?
- Is the hoist operator trained and competent?
- Is the hoist's safe working load clearly marked?
- If the hoist is for materials only, is there a warning notice on the platform or cage to stop people riding on it?
- Is the hoist inspected weekly, and thoroughly examined every six months by a competent person?
- Are the results of inspection recorded?

Cranes and lifting appliances

- Is the crane on a firm level base?
- Are the safe working loads and corresponding radii known and considered before any lifting begins?

- If the crane has a capacity of more than 1 tonne, does it have an automatic safe load indicator that is maintained and inspected weekly?
- Are all operators trained and competent?
- Has the banksman/slinger been trained to give signals and to attach loads correctly?
- Do the operator and banksman find out the weight and centre of gravity of the load before trying to lift it?
- Are cranes inspected weekly, and thoroughly examined every 14 months by a competent person?
- Are the results of inspections and examinations recorded?
- Does the crane have a current test certificate?

Plant and machinery

- Is the right plant and machinery being used for the job?
- Are all dangerous parts guarded, eg exposed gears, chain drives, projecting engine shafts?
- Are guards secured and in good repair?
- Is the machinery maintained in good repair and are all safety devices operating correctly?
- Are all operators trained and competent?

Traffic and vehicles

- Have separate pedestrian, vehicle access points and routes around the site been provided? If not, are vehicles and pedestrians kept separate wherever possible?
- Have one-way systems or turning points been provided to minimise the need for reversing?
- Where vehicles have to reverse, are they controlled by properly trained banksmen?
- Are vehicles maintained; do the steering, handbrake and footbrake work properly?
- Have drivers received proper training?
- Are vehicles securely loaded?
- Are passengers prevented from riding in dangerous positions?

Fire and emergencies

General

- Have emergency procedures been developed, eg evacuating the site in case of fire or rescue from a confined space?
- Are people on site aware of the procedures?
- Is there a means of raising the alarm and does it work?
- Are there adequate escape routes and are these kept clear?

Fire

- Is the quantity of flammable material on site kept to a minimum?
- Are there proper storage areas for flammable liquids and gases, eg LPG and acetylene?
- Are containers and cylinders returned to these stores at the end of the shift?
- If liquids are transferred from their original containers are the new containers suitable for flammable materials?
- Is smoking banned in areas where gases or flammable liquids are stored and used? Are other ignition sources also prohibited?
- Are gas cylinders and associated equipment in good condition?
- When gas cylinders are not in use, are the valves fully closed?
- Are cylinders stored outside?
- Are adequate bins or skips provided for storing waste?
- Is flammable and combustible waste removed regularly?
- Are the right number and type of fire extinguishers available and accessible?

Hazardous substances

- Have all harmful materials, eg asbestos, lead, solvents, paints etc been identified?
- Have the risks to everyone who might be exposed to these substances been assessed?
- Have precautions been identified and put in place, eg is protective equipment provided and used; are workers and others who are not protected kept away from exposure?

Noise

- Are breakers and other plant or machinery fitted with silencers?
- Are barriers erected to reduce the spread of noise?
- Is work sequenced to minimise the number of people exposed to noise?
- Are others not involved in the work kept away?

- Is suitable hearing protection provided and worn in noisy areas?

Welfare

- Have suitable and sufficient numbers of toilets been provided and are they kept clean?
- Are there clean wash basins, warm water, soap and towels?
- Is suitable clothing provided for those who have to work in wet, dirty or otherwise adverse conditions?
- Are there facilities for changing, drying and storing clothes?
- Is drinking water provided?
- Is there a site hut or other accommodation where workers can sit, make tea and prepare food?
- Is there adequate first aid provision?
- Are welfare facilities easily and safely accessible to all who need to use them?

Protective clothing

- Has adequate personal protective equipment, eg hard hats, safety boots, gloves, goggles, and dust masks been provided?
- Is the equipment in good condition and worn by all who need it?

Electricity

- Is the supply voltage for tools and equipment the lowest necessary for the job (could battery operated tools and reduced voltage systems, eg 110 V, or even lower in wet conditions, be used)?
- Where mains voltage has to be used, are trip devices, eg residual current devices (RCDs) provided for all equipment?
- Are RCDs protected from damage, dust and dampness and checked daily by users?
- Are cables and leads protected from damage by sheathing, protective enclosures or by positioning away from causes of damage?
- Are all connections to the system properly made and are suitable plugs used?
- Is there an appropriate system of user checks, formal visual examinations by site managers and combined inspection and test by competent persons for all tools and equipment?
- Are scaffolders, roofers, etc, or cranes or other plant, working near or under overhead lines? Has the electricity supply been turned off, or have other precautions, such as 'goal posts' or taped markers been provided to prevent them contacting the lines?
- Have underground electricity cables been located (with a cable locator and cable plans), marked, and precautions for safe digging been taken?

Protecting the public

- Are the public fenced off or otherwise protected from the work?
- When work has stopped for the day:
  - are the gates secured?
  - is the perimeter fencing secure and undamaged?
  - are all ladders removed or their rungs boarded so that they cannot be used?
  - are excavations and openings securely covered or fenced off?
  - is all plant immobilised to prevent unauthorised use?
  - are bricks and materials safely stacked?
  - are flammable or dangerous substances locked away in secure storage places?

Reference

HSG150: *Health and safety in construction* HSE Books 1996 ISBN 0 7176 1143 4

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HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA Tel: 01787 881165; Fax: 01787 313995. HSE priced publications are available from good booksellers.

For other enquiries ring HSE's InfoLine, tel: 0541 545500, or write to HSE's Information Centre, Broad Lane, Sheffield S3 7HQ.

HSE home page on the World Wide Web: http://www.open.gov.uk/hse/hsehome.htm

This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

HSE
Health & Safety Executive

General access scaffolds and ladders

Construction Information Sheet No 49

Introduction

Falls from a height continue to be the biggest killer on construction sites. This information sheet provides advice for users of ladders and scaffolds. It will also help those who select and specify equipment.

Work at height should be carried out from a platform with suitable edge protection. Occasionally this may not be possible and a ladder may have to be used. Special considerations apply to the use of personal suspension equipment (eg boatswain's chairs and abseiling equipment). These are not covered in this sheet.

Selecting equipment

When deciding what equipment to use think about what the job includes, how long it will last and where it needs to be done. It is tempting to use a ladder for all sorts of work but it is often much safer to work from, for example, a properly erected mobile scaffold tower.

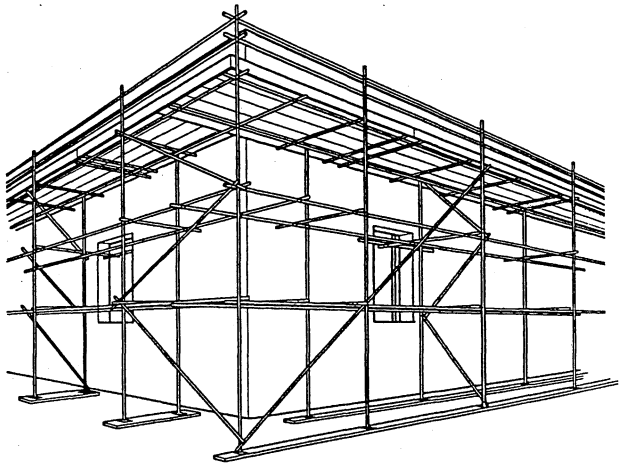
Jobs such as the removal of cast iron guttering, extensive high level painting, demolition work, or any work that cannot be comfortably reached from a ladder should usually be carried out from scaffolds or mobile access equipment.

Protecting the public

- Contact the appropriate highway authority before erecting a scaffold on a public highway.
- Minimise the storage of materials and equipment on the scaffold.
- Scaffolds should be designed to prevent materials falling. Brickguards or netting may need to be provided. Where the risk is very high, for example during demolition or facade clearing, provide extra protection in the form of scaffold fans or covered walkways.
- Prevent people walking under the scaffold during erection or dismantling. Close off the area.
- Stop unauthorised access onto the scaffold, eg by removing all ladders at ground level, whenever left unattended.
- Never 'bomb' materials from a scaffold. Where possible, use mechanical hoists or rubbish chutes to move materials and waste.

Scaffold erection

- All scaffolding work should be carried out under the supervision of a 'competent person'.
- Scaffolds should only be erected by competent scaffolders. There are a number of training courses available for scaffolders.



Typical independent tied scaffolding.

- All scaffolds require bracing to help prevent them from collapsing. The platform of a general purpose scaffold should be at least four boards wide. All scaffolds, including 'independent' scaffolds should be securely tied, or otherwise supported. More ties will be required if:
  - the scaffold is sheeted or netted (ie increased wind loading);
  - it is used as a loading platform for materials or equipment;
  - hoists, lifting appliances or rubbish chutes are attached to it.

Safe use of scaffolds

- Do not take up boards, move handrails or remove ties to gain access for work.
- Changes should only be made by a competent scaffolder.
- Never work from platforms that are not fully boarded.

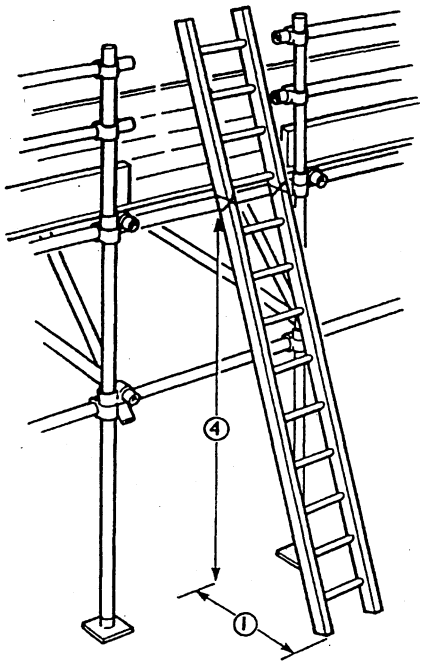
- Avoid overloading the scaffold. Make sure it is designed to take the loads put on it. Store materials so the load is spread evenly.

Scaffold inspection

- **Scaffolds must be inspected by a 'competent person' usually at least every seven days. Any faults found must be put right.**
- **Before contractors allow their workers to use someone else's scaffold they must make sure it is safe.**

For more information on inspection and reports, read CIS 47.

Ladders



Ladders should be correctly angled one out for every four up.

- Ladders should be in good condition and examined regularly for defects.
- They should be secured so they cannot slip, usually by tying them at the top.
- Access ladders should extend about 1 m above the working platform. This provides a handhold for people getting on and off.
- Avoid overreaching: if you are working from a ladder, make sure it is long enough and positioned to reach the work safely.
- Do not climb or work off a ladder unless you can hold onto it.

Stepladders and trestles

- Do not use the top platform of a stepladder unless it is designed with special handholds.
- **Trestle platforms and stepladders must not be used as a workplace above 2 m in height unless proper edge protection is provided.**

Legal requirements

Health and Safety at Work etc Act 1974

Management of Health and Safety at Work Regulations 1992

Provision and Use of Work Equipment Regulations 1992

Construction (Health, Safety and Welfare) Regulations 1996

References and further information

BS 5973:1993 Code of practice for access and working scaffolds and special scaffold structures in steel

Tower scaffolds CIS 10(rev) HSE Books 1997

Construction site health and safety checklist CIS 17 (rev) HSE Books 1996

Inspections and reports CIS 47 HSE Books 1997

Health and safety in construction HSG150(rev) HSE Books 1997 ISBN 0 7176 1143 4

Protecting the public: Your next move HSG151 HSE Books 1997 ISBN 0 7176 1148 5

While every effort has been made to ensure the accuracy of the references listed in this publication, their future availability cannot be guaranteed.

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This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

The leaflet includes mandatory requirements under the Construction (Health, Safety and Welfare) Regulations 1996. These are shown in bold type.

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Trade Contractor Quality Control

by Ed Caldeira, NAHB Research Center

When you have quality problems, do you shop for a new trade contractor that will make your problems go away? Do all the replacement candidates tell you the familiar "we're reliable and do quality work"? Is it the same pitch you heard last year from the trade contractor that you're firing?

Certainly some trade contractors do better than others. But it seems that no matter how many of the poor performers are weeded out, the average quality performance doesn't seem to rise very much.

As surely as you'll have a few new trade contractors next year, you can also be sure that you will have more quality problems and you'll start looking around again.

As the saying goes "if you always do what you do, you'll always get what you got." Changing trade contractors is doing what you always do. Why should you expect overall quality to get better? Improving quality is more than finding new ways to hire and fire trade contractors.

We need to change the approach to quality control. First, we need to know how a trade contractor quality control system should work. To find out, the NAHB Research Center analyzed quality control issues in residential construction, identified areas where the current system needed improvement, and determined how they can be improved. The study concluded that effective quality controls must operate within the trade contractor's work crews to prevent problems before they occur. To accomplish this, the quality control system should set requirements for approved materials, use of qualified persons to perform specific tasks, work standards, explicit sales contracts, and jobsite inspection by the crews performing the work.

ISO 9000, the internationally recognized quality control standard integrates these elements into a comprehensive system. On the basis of ISO 9000, the Research Center developed a Trade Contractor Quality Control Manual (see sidebar).

Builders can use the Trade Contractor Quality Control Manual as a model to help their trade contractors bring good quality control practices to their crews. This

involves training contractors on the approach, helping them to adapt the Manual to their trades, and making sure that it applies to existing quality problem areas.

To test this approach, the Research Center adapted the quality manual to the insulation trade. This involved obtaining all of the manufacturer's installation standards, developing an insulation inspection checklist and training contractors in the quality control system. Three insulation contractors participated in an pilot program sponsored by CertainTeed. This program produced positive results, and a second program for External Insulation and Finish System (EIFS) Installers has been designed and is in the pilot testing phase.

Assessing compliance to the quality control requirements is straightforward. The first step is to verify the paper trail of contracts, jobsite inspections, use of approved materials, and records of qualified installers. The next step involves detailed jobsite audits to observe workmanship, use of materials, and quality control procedures. The Research Center uses these procedures in a new program to independently certify the quality controls of insulation contractors. Currently over 65 contractors are certified.

Next time you have a quality problem with a trade contractor don't just change your contractor, change your contractor's quality controls!

Trade Contractor Quality Control Guidelines

The NAHB Research Center's Trade Contractor Quality Control Manual sets requirements that enable trade contractors to address key elements of a quality control system. The manual provides a general approach that is to be tailored to each trade.

Qualified Materials and Installation Procedures

Materials and the designed use of materials are critical elements of quality installations. To prevent confusion regarding what materials are to be used and how, a list is made of acceptable materials, acceptable installation methods, and any requirements for special equipment.

Qualified Installers

Installer capabilities are critical to every quality installation. Trade contractors may set their own standards and methods for evaluating the installers' skill, knowledge, and workmanship or recognize a trade skills certification program. When all requirements are met, trade contractors keep lists of installers qualified to perform various installation tasks. Helpers may assist on the jobsite, although quality responsibility remains with the qualified installer.

Sales Contracts

Sales contracts must clearly describe the work to be performed. The contracts are used as the basis for an agreement with the builder, and by installation crews for work instructions. The contracts consist of two parts. The first part, Installation Requirements, defines the responsibilities of the builder and of other trade contractors necessary for a high performance, durable installation.

The second part of the sales contracts is called the Scope of Work. It contains the specifications for installation work to be performed by the trade contractor.

Jobsite Inspections

The preceding sections describe the foundation for quality controls on the jobsite. Jobsite inspections involve checklists specific to each trade to verify that approved materials are used according to the installation instructions, that qualified installers perform the work, and that the Scope of Work requirements are met.

Each inspection checklist should address key quality control checkpoints and quality problem areas specific to the trade. Quality inspections should use checklists at each work phase to verify that:

- architectural design requirements and building conditions are suitable for installation;
- previous work phases are complete;
- work was performed by qualified personnel;
- only approved materials were used;
- The amount of materials used was sufficient to complete the work phase;
- Scope of Work requirements have been met;
- installation specifications and procedures have been met;
- the work phase is complete; and
- any quality problems have been corrected.

Quality System Audits

Periodic audits assess whether the system is effective at controlling quality, and whether the contractor is conforming to the requirements of the Trade Contractor Quality Manual. The audits involve periodic reviews of installation crew performance, and of the overall quality system. They can be performed by the trade contractor, builder, or a third party auditor.

Quality questions? Looking for specifications? Call the ToolBase Hotline (800)898-2842.

The NAHB Research Center is the not-for-profit research arm of the National Association of Home Builders, and is located in Upper Marlboro, MD. In its nearly 40 years of service to the home building industry, the Research Center has provided product research and building process improvements that have been widely adopted by home builders in the United States. Through testing and certification services, the NAHB Research Center seal is recognized throughout the world as a mark of product quality and an assurance of product performance.

NOTE TO EDITORS ON STYLE USAGE: In order to correctly identify this company and its work, first reference should be "NAHB Research Center." If clarification of the acronym is necessary, the phrase, "a subsidiary of the National Association of Home Builders (NAHB)," can follow. In subsequent mentions, "Research Center" is the only acceptable and accurate alternative reference.

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Inspection Checklists for Trade Contractors

by Ed Caldeira, NAHB Research Center

A properly designed inspection checklist form can demonstrate due diligence in complying with regulations, manufacturer's instructions, and workmanship standards. You can use it to set expectations for what needs to go right, and once completed it can serve as a record of what actually happened.

The trade contractor's crew supervisor should use an inspection checklist to perform inspections on every job. If the trade has several phases of work on a home, prepare a separate inspection form for each one. In addition, the builder can use a copy of the same forms while performing quality reviews.

ISO 9000, the internationally recognized quality control standard, sets requirements necessary to assure conformance to specifications. The ISO 9000 approach not only assures that specifications are met but also confirms that all the elements of a reliable construction process are in place.

Jobsite Installation Record provides basic information about job location, start date, and the type of product or system that is to be installed.

Job Readiness questions verify there are no adverse conditions that impact quality and the job is suitable for work to begin. This should include availability of installation instructions and adequacy of work performed by previous trades, as well as building or environmental conditions that can affect quality.

Use of Materials should be documented. When materials affect quality, the inspection form should capture specific information on primary as well as secondary materials when they make a difference to the completed job.

Installation Inspection questions verify that product manufacturer's specifications are followed and that workmanship meets expectations. Examine manufacturer's installation instructions, NER product evaluation reports, codes, and regulations to identify key requirements that need to be followed for performance and durability. Supplement this with provisions for the needs of the following trades and your own expectations. Whenever inspection questions verify conformance to dimensional specifications, actual

measurements should be recorded. Also verify the use of specific equipment or tools if they affect quality results.

Problems Found should be recorded, even if they are corrected. When the problem results in a deviation from specifications, note the deviation.

Job Complete sign-off should be done by the responsible craftsman after verifying satisfaction with workmanship and that the work is complete to specification. List any remaining repair items to be completed.

I encourage you to collaborate with your trade contractors and product manufacturers to prepare inspection checklists for each of your trades. The jobsite inspection checklist is an important element of a builder's quality control system to help you build problem-free, durable homes.

A sample "Trade Contractor Inspection Checklist" and answers to your quality questions are free by calling the NAHB Research Center's ToolBase Hotline ***(800) 898-2842****. Visit the quality pages at http://www.nahbrc.org.*

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www.nahbrc.org

The Devil is in the Details

by Ed Caldeira, NAHB Research Center

You may not be aware of errors embedded into the normal construction practices used by your trades. Ensuring that these practices are correct may be a significant opportunity to improve the strength, durability and performance of your homes.

In the last few years, high-profile construction failures have been caused in part by practices that were considered normal, but were not correct. A contributor to the rotted framing problems for EIFS synthetic stucco clad homes was the common practice to deviate from manufacturer installation instruction when sealing window openings. In Florida, normal framing techniques that did not comply with building codes led to the loss of many roofs during hurricane Andrew. These examples are just the tip of the iceberg.

From flexible ducting installation to window flashings, from roof truss attachment to fastening drywall, normal practices can vary significantly from recommended practices. Break the cycle by taking time out to compare your construction details with recommended practices.

Focus on one trade at a time. Read the wealth of information contained in manufacturer's installation instructions, reference standards,* code evaluation reports, building codes, and your own scope of work specifications.

On the job site, watch the trade craftsmen perform their work. Make point-by-point comparisons between each recommended practice and your observations. Take notes on every material they use including fasteners, adhesives, and secondary parts. Pay attention to every dimension, actual tolerances achieved, and details like nailing schedules.

Each discrepancy should prompt a review. Contact the experts at the product manufacturer, trade association, or the NAHB Research Center's ToolBase Hotline* to get an understanding of the requirement. The experts will help you discover opportunities to make significant quality improvements.

Jim Hoffner of K. Hovnanian, a 1997 NHQ winner, studied the carpet installation process in their homes and compared them with the Carpet and Rug Institute's (CRI) Carpet Installation Standard 105. By discussing technical requirements with Carroll

Turner at CRI he learned how to upgrade the strength of carpet seams for high-traffic areas by taping padding joints and sealing carpet seams. Hoffner also discovered opportunities to prevent problems and extend the life of carpet installation through the proper use of power stretchers and revised specifications for carpet padding. These requirements are being integrated into their ISO 9000 quality plan for carpet installation.

Follow up quality reviews with an internal training session involving your field staff, the trade contractor, and the product supplier. Review findings and discuss revisions to construction practices. Update the quality-control system to reflect the changes.

If you perform a detailed quality review for one additional trade every month, within a year, noticeable improvements can be made throughout your construction process to improve strength, durability, and performance of the homes you build.

** For free technical assistance or to locate quality standards call the NAHB Research Center's ToolBase Hotline (800) 898-2842. Visit the quality pages at www.nahbrc.org.*

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Integrating Quality and Safety Programs

by Ed Caldeira, NAHB Research Center

Field personnel must combine good safety and quality practices into their work, however most construction companies manage quality and safety as two independent programs. Integrating quality and safety into a single program can streamline operations and create synergies that improve results.

From a management and control perspective, there are similarities between quality and safety programs. Both programs ensure work is done the right way from their viewpoint. Each program has a system of performance standards, verifications, and corrective actions. There is an opportunity to capitalize on these similarities.

"We believe in producing a quality product and producing it safely," says Craig Steele, president of Schuck and Sons, a Phoenix framing contractor. "We have a safety system that has earned national recognition. We also have a quality system based on ISO 9000 principles, one of the first to be certified by the NAHB Research Center. Now, as we evolve, the next horizon is to include safety in our quality system."

Adjustments are necessary to create a single system that serves both quality and safety. Start by specifying materials, equipment, work procedures, and job rules that lead to quality and safety. Related training can present employees with the right way to work that addresses both quality and safety.

Quality inspection procedures can be expanded to encompass safety concerns. Existing inspection procedures can be adjusted to track and record the presence of trained personnel, the use of safety equipment, compliance with worksite rules, and work conditions.

As inspections uncover safety problem areas, preventing recurrence draws from the strength of the quality improvement processes. First, quality methods are used to uncover root causes and plan changes that prevent recurrence of the issue. This could involve changing equipment, materials, construction methods, work rules, or company policy. Regular toolbox talks can communicate changes to field personnel.

"We have toolbox talks every week with every crew," says Hank Zolkiewicz, Manager of Del Webb Contracting Services, Sun City West, AZ. "Our safety

and quality topics reinforce the safety procedures and construction details. When hotspots come up they go on the list and we talk about them too."

When quality and safety are combined management and employees can identify with a much simpler plan. For management there is only one system to manage that fully integrates quality and safety into the business operations of the company and continuously improves performance. For employees, it is easier to work within a management framework that presents a single message about the right way to work.

Request the free "Quality and Safety Fact Sheet" by calling the NAHB Research Center's ToolBase Hotline at 800-898-2842 or email toolbase@nahbrc.org.

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